REMARKS/ARGUMENTS

Claim 27 has been amended and claims 15-34 remain pending in the application. Reconsideration is respectfully requested based upon the following remarks.

In the final Office Action mailed April 9, 2004, claims 27-34 were rejected under Section 112, first paragraph as failing to comply with the enablement requirement. Claim 27 has been amended in order to overcome this rejection, as agitation has been removed as one of the recited conditions for changing the cleaning liquid from an emulsion to a one-phase solution. However, if it is determined that this amendment is not sufficient to overcome the rejection, the Examiner is kindly requested to telephone the undersigned in order to further discuss this rejection and identify an acceptable amendment.

It should be noted, however, that in the inventive method of claim 27, agitation (and/or e.g., ultrasound) may be utilized in combination with at least one of pressure and temperature to maintain the cleaning liquid in the state of an emulsion and the present amendment is in no way intended to exclude such possibility.

In the final Office Action, claims 15 and 27 were rejected as lacking novelty over WO 96/28535 and its US counterpart, US Patent No. 5,876,510. Applicant respectfully traverses this novelty rejection. As WO 96/28535 contains identical teachings as US Patent No. 5,876,510, reference will be made to the text of WO 96/28535 in the following discussion, although it should be understood that these arguments distinguish claims 15 and 27 from both references.

It is respectfully submitted that WO 96/28535 does not teach the step of "removing contaminants from the cleaning liquid while the cleaning liquid is in the state of the homogeneous, one-phase solution," which is recited in claims 15 and 27.

In addition or in the alternative, WO 96/28535 does not teach the step of "changing the state of the cleaning liquid from the two-phase solution into the homogeneous, one-phase solution by application of the second set of conditions," which is recited in claim 15, or the step of "subjecting the cleaning liquid to the second set of conditions, wherein the cleaning liquid is brought into the state of the homogeneous, one-phase solution," which is recited in claim 27.

It is first noted that the following arguments A-D for distinguishing WO 96/28535 from claims 15 and 27 are independent from each other. Because failure to disclose any one element of a claim is sufficient to avoid a novelty rejection, the following respective arguments are intended to be considered individually and any single argument is sufficient to overcome this novelty rejection. However, since claims 15 and 27 in fact distinguish from WO 96/28535 for a plurality of reasons, the following arguments A-D amply demonstrate that WO 96/28535 is not particularly relevant to the pending claims and no estoppel based upon said arguments is intended and/or warranted.

As a basis for the following arguments A-D, it is initially noted that the cleaning and rinsing liquids of WO 96/28535 are recycled by azeotropic distillation, as was stated in paragraph 6 of the final Office Action. By "azeotropic distillation," the skilled person understands that the water and organic components are removed from the cleaning liquid in a gaseous or vapor phase, which is then later re-condensed. As a result, a skilled person would also understand that the

contaminants always remain in the liquid phase of the cleaning liquid that is disposed in the distillation column. That is, by boiling off the water and organic components during distillation, the contaminants are actually concentrated in (rather than removed from) the liquid cleaning solution within the distillation column until the liquid in the distillation column becomes an essentially aqueous only phase. See page 17, line 34 to page 18, line 3 of WO 96/28535.

A. Consequently, according to the azeotropic distillation method of WO 96/28535, the contaminants are never removed from the cleaning liquid while the cleaning liquid is in the liquid state, as is recited in claims 15 and 27. To the contrary, the contaminants always remain in the liquid cleaning solution and a gaseous phase is boiled off the cleaning liquid in order to purify the water and organic phases of the combined cleaning and rinsing liquids of WO 96/28535. Thus, claims 15 and 27 are novel for at least this reason.

B. In addition or in the alternative, it is noted that when the residue (contaminants), which is retained with the essentially aqueous phase in the bottom of the distillation column, is further processed as discussed at page 18, lines 2-3, this water/contaminant mixture will not be a homogeneous, one-phase solution. Rather, the water/contaminant mixture will be a two-phase aqueous/oil solution due to the hydrophobic contaminants that are trapped in the distillation column with the remaining excess water. Thus, removal of contaminants from this non-homogeneous, two-phase solution, which remains in the distillation column after the distillation step, also would not meet the final limitation of each of claims 15 and 27. Thus, claims 15 and 27 are novel for this reason as well.

C. In addition or in the alternative, the cleaning liquids taught by WO 96/28535 are never converted from a two-phase liquid to a homogeneous, one-phase liquid solution, either in the distillation column during the distillation process or in the cleaning/rinsing tanks during the cleaning/rinsing process. While WO 96/28535 teaches that azeotropic distillation is performed, it should be appreciated that an "azeotrope" is merely defined as a solution containing at least two liquids having different boiling temperatures when pure, but which have a single boiling temperature when mixed. More importantly, an azeotrope can be either a one-phase solution or a two-phase solution of the two or more components. Thus, both homogeneous (one-phase liquid) azeotropic distillation and heterogeneous (two-phase liquid) azeotropic distillation are known in the art and WO 96/28535 does not expressly state which distillation technique is used.

However, WO 96/28535 implicitly teaches a skilled person that heterogeneous azeotropic distillation is performed because the condensate is separated into a water-rich phase and an organic-rich phase just after the azeotropic vapor is condensed. Page 18, lines 10-11. Thus, if the condensate is two-phase just after condensation, and azeotropic distillation means that the two components are boiled off in the same proportion as the heated liquid, then the liquid being boiled in the distillation column also must be two-phase.

Heterogeneous (i.e., two-phase) distillation is confirmed by the additional following facts. For example, at page 3, lines 19-27, WO 96/28535 specifically teaches that the azeotropes of WO 96/28535 exhibit phase separation (i.e., water-rich phase and solvent-rich phase) at temperatures up to at least 98°C, which means that the heterogeneous azeotropic liquids would be two-phase above that

temperature if the boiling temperature is higher than 98°C. Further, in Table I at pages 4 and 5, most of the described azeotropes have boiling points less than 98°C and, as taught at page 17, lines 25-27, the preferred distillation temperature is 99°C or less. Moreover, at page 18, lines 11-13, the separation of the two-phase condensed azeotropic liquid preferably occurs up to 98°C, which is above the boiling point of many of the preferred azeotropes of WO 96/28535. If the liquid azeotrope is two-phase just after condensation, it must also be a two-phase liquid just before boiling off.

Thus, while the vapor phase distilled from the cleaning liquid would be a gaseous mixture of water and glycol ether, due to the fact that the azeotropic vapor will have a predetermined amount of water and organic, the heterogeneous (two-phase) liquid remaining in the liquid state within the distillation column of WO 96/28535 will remain a two-phase liquid throughout the distillation process. In fact, at page 17, line 34 to page 18, line 3, it is specifically recommended to add an excess of water so that an aqueous-only phase will remain in the distillation column when the distillation is complete. Furthermore, at page 20, lines 2-3, it is indicated that the preferred liquid azeotrope contains about 30% propylene glycol mono n-butyl ether and about 70% water. At these concentrations, the azeotropic liquid of the preferred embodiment of WO 96/28535 is two-phase at (and up to) the azeotropic boiling point. Consequently, these teachings clearly indicate that heterogeneous azeotropic distillation is inherent to the distillation process of WO 96/28535 and WO 96/28535 provides no suggestion or motivation to perform a homogenous (one-phase liquid) distillation.

In fact, WO 96/28535 fails to teach how homogeneous azeotropic distillation could be performed with the cleaning and rinsing agents disclosed therein.

Therefore, according to the teachings of WO 96/28535, distillation of the azeotropic solution (i.e., vaporous removal of the water and glycol ether from the liquid cleaning solution) takes places while the liquid cleaning solution is a non-homogeneous, two-phase liquid. Therefore, it is respectively submitted that claims 15 and 27 are novel over WO 96/28535 for this reason as well.

D. In addition or in the alternative, as briefly mentioned at page 3, line 6-8, the cleaning step of WO 96/28535 may be performed while the cleaning liquid is a two-phase solution. A similar statement is made at page 16, lines 7-9 concerning the rinsing liquids. However, as will be discussed further below, the vast majority of the description of WO 96/28535 actually concerns cleaning objects using a one-phase cleaning liquid.

Therefore, the preferred embodiments of WO 96/28535 (i.e., the one-phase liquid cleaning solutions) also do not meet the first step of claim 15 and the first and second steps of claim 27. Furthermore, because the preferred "organic solvents" must phase separate no higher than 98°C, WO 96/28535 thus teaches, for such embodiments, supplying the one-phase cleaning liquid to the distillation column, where it is mixed with the one-phase rinsing liquid to form a two-phase azeotropic liquid before distillation. Thus, the preferred embodiments of WO 96/28535 are exactly opposite to claims 15 and 27, which contemplate converting the two-phase cleaning liquid into a homogeneous, one-phase cleaning liquid before removing contaminants therefrom.

Moreover, no embodiments of WO 96/28535 teach or suggest changing the state of the cleaning liquid from a two-phase liquid solution to a one-phase liquid solution prior to the contaminant removal (distillation) step. Thus, because WO 96/28535 never teaches or suggests converting a two-phase cleaning liquid to a homogeneous, one-phase liquid prior to removing contaminants, WO 96/28535 cannot destroy the novelty of claims 15 and 27 for this additional independent reason.

In summary, because the teachings of WO 96/28535 significantly differ from the claimed inventions for multiple, independent reasons, a prima facie case of lack of novelty has not been made. Consequently, withdrawal of the novelty rejection is respectfully requested.

Furthermore, in addition to not destroying the novelty of claims 15 and 27, WO 96/28535 does not suggest or motivate a skilled person to (i) change the state of the two-phase cleaning liquid to a one-phase liquid solution and/or (ii) remove contaminants from the cleaning liquid while the cleaning liquid is in the state of being a homogeneous, one-phase liquid. As discussed at page 19, lines 29-31 of WO 96/28535 and as shown in Figure 1 therein, the contaminated cleaning liquid is transferred directly from the cleaning tank 1 to the distillation device 4 without any intervening processing, such as filtering. Moreover, no description in WO 96/28535 suggests or motivates a skilled person to remove contaminants from a homogeneous, one-phase cleaning liquid before the cleaning liquid is subjected to heterogeneous azeotropic distillation.

A skilled person would have had no practical motivation for removing contaminants from the cleaning liquid between the cleaning tank 1 and the distillation

device 4, because the contaminants will be retained with the aqueous phase that remains in the distillation device 4 after distillation, as discussed at page 17, line 33 to page 18, line 3. Thus, no practical purpose would be served, e.g., by filtering the cleaning liquid before distillation, as the distillation step will effectively concentrate the contaminants in the aqueous phase that remains within the distillation column after distillation. In other words, by following the teachings of WO 96/28535, a skilled person would have understood that the contaminants are easily, effectively and efficiently removed in a single distillation step. On the other hand, if an intervening processing step is inserted before the distillation step, the skilled person would understand that contaminants would be removed in two different locations, thereby inefficiently increasing the contaminant removal processing without any resulting benefit. Thus, it is submitted that WO 96/28535 actually teaches away from removing contaminants from the cleaning liquid before distillation.

Moreover, it is noted that, pre-distillation, the cleaning liquid may contain insoluble and soluble contaminants, depending upon the nature of the contaminants on the objects that are cleaned. Filtering the cleaning liquid before distillation would only remove the insoluble contaminants, which insoluble contaminants of course can be more efficiently removed in one step by the distillation process. Thus, as was discussed above, a skilled person would have recognized that no practical purpose would be served by inserting an additional filtration step before the distillation step, because the distillation step will effectively and efficiently remove the insoluble contaminants.

However, even if the Examiner disagrees with these arguments and still believes that a skilled person would have been motivated to filter the cleaning liquid

between the cleaning tank 1 and the distillation device 4, the skilled person would not have been motivated by WO 96/28535 to convert a two-phase cleaning liquid to a homogenous, one-phase liquid before the distillation step, because such a step could be expected to, e.g., increase the energy requirements of the WO 96/28535 system to perform the distillation step. In order words, the skilled person would have been motivated to maintain the cleaning liquid of WO 96/28535 at as high a temperature as possible before distillation, so as to minimize the overall energy requirements of the system. If the temperature of the cleaning liquid were to be reduced before distillation, additional energy would, of course, be required to heat up the cleaning liquid again in order to perform the distillation step. Thus, a skilled person would have been motivated to avoid any pre-distillation processing, which would cool the cleaning liquid and thereby increase the energy and processing requirements of the system, while not providing any particular advantage.

Thus, even if the Examiner believes that a skilled person would have been motivated to insert a filter between the cleaning tank 1 and the distillation device 4, there is absolutely no suggestion or motivation to, e.g., convert a two-phase cleaning liquid into a one-phase liquid solution before the filtration takes place. To the contrary, a skilled person would have been motivated to maintain (or increase) the temperature of the cleaning liquid between the cleaning tank 1 and the distillation device 4 for the reasons noted above.

In short, any additional contaminant removal processing before the distillation step in the methods taught by WO 96/28535 would be inefficient and result in no additional benefit. In fact, due to the extra processing and energy requirements, such pre-distillation processing could only result in detrimental effects of using the

teachings of WO 96/28535. Thus, a skilled person would have been motivated to precisely follow the teachings of WO 96/28535 without modification, thereby directly supplying the contaminated cleaning liquid to the distillation device without any intervening processing. In particular, it is noted that WO 96/28535 expressly teaches that the distillation process described therein is "very cost-effective" and makes no mention of any other contaminant removal processing as being advantageous for any reason.

It is also noted that a skilled person also would not have been motivated, e.g., to filter the condensed cleaning agent after the distillation step in order to remove contaminants therefrom, as the distillation step will effectively purify the aqueous and organic phases, as is taught at page 18, lines 24-27. In other words, no practical purpose would be served by subjecting the purified aqueous and organic phases to additional contaminant removal (e.g., filtration), because distillation is one of the most highly effective techniques for separating and purifying liquids.

Thus, the skilled person would have been motivated to directly supply the cleaning liquid from the cleaning tank 1 to the distillation device 4 at as high a temperature as possible and without any intervening or post-processing steps.

Finally, as was noted above, WO 96/28535 includes the following statement at page 3, lines 6-8: „The percentage of water in the cleaning agent may be higher than its solubility in the organic solvent at the given cleaning temperature; in this case the cleaning agent is an emulsion." However, this statement is the only suggestion that a two-phase cleaning liquid might possibly be utilized. No other express statement that two-phase cleaning was intended can be found in WO 96/28535.

In fact, to the contrary, nearly all the description in WO 96/28535 is solely directed to one-phase cleaning. For example, according to the preferred embodiment described at page 19, line 13 to page 20, line 11, WO 96/28535 teaches a cleaning agent that is a „saturated solution of water in propylene glycol mono n-butyl ether." Similarly, the rinsing agent is a „saturated solution of propylene glycol mono n-butyl ether in water." The cleaning and rinsing steps are performed at 65°C. Therefore, WO 96/28535 states that the cleaning liquid contains about 12% water in propylene glycol mono n-butyl ether and the rinsing liquid contains about 4.5% propylene glycol mono n-butyl ether in water. (Page 19, lines 21-25.)

After the one-phase cleaning and rinsing liquids have become contaminated, the cleaning and rinsing liquids are combined to form a two-phase azeotropic liquid and then subjected to heterogeneous azeotropic distillation. (Page 19, lines 29-38). According to page 20, lines 2-3, the combined azeotropic liquid preferably contains about 30% propylene glycol mono n-butyl ether and about 70% water. Thus, this azeotropic liquid will be two-phase at 65°C or higher.

After distillation, the two-phase condensed liquid is transferred to a liquid/liquid separator 6 and separated into a water-rich phase 10 and an organic-rich phase 11. (Page 20, lines 6-7.) A skilled person clearly understands that a liquid/liquid separator 6 is intended to separate a two-phase liquid into two separate one-phase liquids.

According to the teachings at page 18, lines 24-27, the organic-rich phase can be used without modification as the cleaning liquid and the water-rich phase can be

used without modification as the rinsing liquid. This procedure is confirmed by the statement at page 20, lines 7-9.

Thus, according to the preferred teachings of WO 96/28535, after distillation, the two-phase condensed azeotropic liquid is allowed to reach equilibrium in the liquid/liquid separator 6 in order to be separated into two one-phase liquids. In other words, WO 96/28535 clearly intended that the two-phase condensed azeotropic liquid would separate into a water saturated organic phase and an organic saturated aqueous phase, wherein each of these two separated phases will be fully dissolved (one-phase).

The one-phase cleaning liquid is then supplied to the cleaning tank 2 without modification and the one-phase rinsing liquid is supplied to the rinsing tank 3 without further modification. Consequently, the preferred cleaning step of WO 96/28535 is performed with a one-phase cleaning liquid and the rinsing step is performed with a one-phase rinsing liquid.

Therefore, although WO 96/28535 makes one brief mention that two-phase cleaning is possible (within the context of a 20 page description), WO 96/28535 certainly provides no concrete examples of such two-phase cleaning, nor does WO 96/28535 describe the unexpected benefits of utilizing a two-phase cleaning liquid instead of a one-phase cleaning liquid. In particular, as discussed at page 3, line 21 – page 4, line 11 of the present specification, two-phase cleaning provides remarkably superior cleaning, as compared to one-phase cleaning. Because WO 96/28535 makes no mention of such superior cleaning results, it fails to motivate a skilled person to utilize the cleaning liquid in the two-phase state, as opposed to the one-phase state. To the contrary, the vast majority of the teachings of WO 96/28535

motivate a skilled person to utilize a one-phase cleaning liquid, for the reasons noted above.

Thus, WO 96/28535 suggests and motivates a skilled person to perform the cleaning step utilizing a one-phase cleaning liquid and a one-phase rinsing liquid. In other words, WO 96/28535 motivates the skilled person to utilize a more complicated and less effective cleaning/rinsing step than the presently claimed cleaning step.

Then, the respective one-phase cleaning and rinsing liquids are combined to form a two-phase azeotropic liquid mixture that will be distilled, so as to remove the water and organic phases from the contaminants that remain in the two-phase liquid. Again, WO 96/28535 provides no suggestion or motivation to convert a two-phase cleaning liquid into a one-phase liquid before removing contaminants from the one-phase liquid, nor does WO 96/28535 provide any mention of the substantial advantages (e.g., no need for a distillation column or significant amounts of energy to perform the distillation step) of performing the contaminant removal process according to the claimed steps.

Thus, when the entire teachings of WO 96/28535 are considered by a skilled person, it is clear that WO 96/28535 primarily relates to one-phase cleaning followed by two-phase (heterogeneous) distillation, which is categorically different from the methods of claims 15 and 27. No hint is provided by WO 96/28535 that would have motivated a skilled person to substantially modify the teachings of WO 96/28535 to achieve the presently claimed inventions.

For all the foregoing reasons, WO 96/28535 does not destroy the novelty of claims 15 and 27. Moreover, a skilled person would not have been motivated to modify the teachings of WO 96/28535 so as to achieve the inventions of claims 15

and 27. Therefore, it is respectfully requested to withdraw the rejection based upon WO 96/28535 and pass the application to allowance.

Applicant has attempted to be fully compliant in this response to the outstanding Office Action and believes that the application is now in condition for allowance. However, should the Examiner have any further comments or suggestions, the undersigned would very much welcome a telephone call in order to expedite placement of the application into condition for allowance.

Respectfully submitted,

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